shall enable the young and healthy to deposit the fruits of their economy as a provision for age, at the same time that it receives the aid of the benevolent, and administers comfort without conferring disgrace, is entitled to support.

IX. That the institution commenced under the name of "TRANQUILLITY" being intended to promote these among other important objects, a subscription shall be opened to assist its establishment.

X. That the sums so raised be paid to Messrs. Hodsoll and Stirling, Strand, bankers to that institution, and be at the disposal of its committee of Superintendence or Directors.

XI. That a subscription of One Guinea admission, and one guinea per annum, shall constitute a member of "The Society for the gradual Abolition of the Poor's Rate."

XII. That every respectable person be invited to become a member thereof, and that each member be particularly requested to introduce as many friends as he can.

XIII. That the Secretary of Tranquillity be the Secretary of this Society, and report the progress of that institution to this society every quarter.

XIV. That any and all Expenses attendant upon this society, shall be paid at the end of every Three Months out of the contributions, and the balance thereof shall then be paid over to the committee of superintendence or directors of Tranquillity.

XV. That as soon as the directors of that institution shall find it convenient, this society will co-operate with them in their application to Parliament to effect the gradual abolition of the poor's rate, and to encourage individuals in the various classes of the community to make provision for themselves, by exempting from Parish assessments, on account of the poor, all those persons who are provided for by that establishment.

XVI. That this society will particularly attend to all communications of facts calculated to promote its object.

XVII. That this society shall meet every Wednesday at Twelve o'clock at Noon, at tne office of Tranquillity, Albion-street, Black Friars Bridge.

By Order, W. Hone, Sec.

*** Subscriptions will be received by Messrs. Hodsoll and Stirling, bankers, Strand; and by the *Secretary* at the *Office* of *Tranquillity*.

BIOGRAPHICAL SKETCHES OF DISTINGUISHED PERSONS.

A SKETCH OF THE LIFE OF JOSEPH BLACK, M.D.F.R.S. OF LONDON AND EDINBURGH. BY M.B.L.S.

AS biographical sketches of distinguished persons occupy a capital line in your publications, I take the liberty of recommending to you a sketch of the life of Dr. Black, the late celebrated professor of chemistry and medicine, in the university of Edinburgh; not that I suppose lovers of science have neglected to hand down his name and merit to posterity, but that a more perfect history of his family and labours might be collected from the different recorded histories of him, than is contained in any one of them, by a person who was personally acquainted with him, and many branches of his family.

John Black, the doctor's grand-father, was an eminent merchant in Belfast, and was married to Miss Jane Eccles of Malone, two miles from Belfast; William the III, was her father's guest, when on his march from Carrickfergus to Drogheda.—Her brother Sir John Eccles of Dublin, was so much respected by the inhabitants of that city, that they honoured him with the name of one of their principal streets. John Black and his wife Jane Eccles, were patterns of piety and virtue; and they not only instructed their children in the principles of religion and morality, while they remained with them; but continued their wise instructions and exhortations by letters, when they were removed from them to far distant countries.*

* Extract of a letter to John Black, jun. dated Belfast, Sep. 8th, 1698.

"Son John, shun all occasions of evil, hate lying, swearing, and sabbath breaking. Begin the day with prayer, for a blessing on your lawful endeavours; end it with thankfulness for mercies; observe your master's lawful commands, from which withdraw not without leave. Your christian and dutiful carriage, will add much to our comfort, who wish much for your happiness. God direct you and grant you his blessing, is the prayer of your affectionate father,
JOHN BLACK"

John Black, and Jane his wife lived and died in Belfast, where their tomb still remains, on which is this inscription.*

The doctor's father, John Black, jun. removed from Dublin to Bourdeaux in the year 1699, where he was merchant and factor; and there became acquainted with Mr. Robert Gordon, who was likewise merchant and factor, and of the same religious principles. He was a branch of the ancient family of Gordon of Hallhead in Aberdeenshire. Mr. Black married Mr. Gordon's daughter Margaret, in 1716. They by this marriage had 8 sons and 5 daughters, all born in Bourdeaux. As there was no English school convenient at the time, the education of their children devolved upon their father and mother. They all grew up to be men and women, and were settled in different parts.

The situation of the family in 1764 appears in a note in Mr. Black's hand. John Black, as is recorded in the public register in Belfast, was born and christened there in 1681, was a factor at Bourdeaux during 57 years, at present, 1764 in Dublin. His numerous family of children, still alive, were dispersed thus: John his eldest son, his wife and children, are at Bourdeaux; Robert in the Isle of Man; Isabel with her fourteen children at Aberdeen; Jane in Dublin; George at Belfast; Joseph at Glasgow; Esther at Dublin; Alexander in London; Samuel at Belfast; Catherine at Newtownards; James at London, and Thomas in Belfast.

George, a merchant, lived and died in Belfast, and left a family—Samuel, a linen draper, died likewise in Belfast, unmarried.—Alexander and James are still living in London, and Catherine (Mrs. Turnly) in Belfast.

When John, the Drs. father, expressed his resolution of leaving France, and returning to his native country, his acquaintances expressed the most sensible regret, especially his intimate friend, the great president Montesquieu, who on hearing his intentions of leaving Bourdeaux, wrote to him in the most affectionate manner; among many expressions of sorrow his letter contains the following; "I cannot be reconciled to the thoughts of your leaving Bourdeaux. I lose the most agreeable pleasure I had, that of seeing you often, and forgetting myself with you."

The antient judges, magistrates and most eminent merchants in Bourdeaux without the knowledge of Mr. Black wrote the following attestation. We the under subscribers, inhabitants of Bourdeaux, certify and attest that Mr. John Black, merchant, dwelling at the Charterhouse, is settled in Bourdeaux since the year 1699 and that he married a wife here, and carried on his trading business, always after a legal and fair manner, and ever has behaved himself so as to acquire the confidence, the esteem and consideration of all those acquainted with him, to the truth whereof we have signed the present certificate in Bourdeaux this 27th February 1755, signed, P. Nairac, Figer de Cater, Dubergies Laffore, &c. &c.

This with his contract of marriage, contracts for houses, cellars, vineyards, and lands, and the church of St. Andrews, and St. Seuerin's christening certificates of his 12 children, were sent for and delivered to Monsieur le Marquis de Tournyour Intendant of the Province to make his report thereof to the king's minister: these were all detained by him about three months, till by the intercession of first-rank friends at court they were presented. His Majesty then ordered that he should not be of the number of British subjects to be expelled, but remain as long as he pleased with his family unmolested in Bourdeaux; all his other papers were then restored, but the attestation was kept at Court.

Willing to end his earthly race in

* *John Black, merchant in Belfast, departed this life the 25th March*, 1725-6 *aged* 88 *years. Jane Black, alias Eccles, his wife, departed this life* 15*th October*, 1701, *aged* 48.

his native country, he returned to Ireland next year and purchased an estate in the county of Armagh, where he resided some years. He and his wife Margaret Gordon died in Belfast, and were buried in his father's tomb.

The character of John Black, the younger, is thus given by a gentleman who had the best opportunity of knowing it. He was cheerful and contented, benevolent and liberal-minded; he was industrious and prudent in business, of the strictest probity and honour, very temperate and regular in his manner of life.

His son Joseph, the subject of this memoir, was born at Bourdeaux in the year 1728. All the family were educated by their father and mother, there being no English school at Bourdeaux at that time. In the year 1740 Joseph was sent home to Belfast, and put under the care of Mr. Sprot, a relation of the antient family of Maxwell, of Comber, in the county of Down, who was eminently perfect in the knowledge of the learned languages. He finished the classical education of many learned men, such as Gamble, Ferguson, M'Tear and Haliday, respectable physicians in Belfast.

When Joseph finished his classical education he was sent to the College of Glasgow, at that time famous for eminent professors of mathematics and all the different branches of philosophy. When he had gone through the graduate's course, he chose the practice of medicine, as being most consonant with his philosophic genius and the improvement he had made in physical knowledge.

Dr. Cullen was at that time professor of medicine and lecturer upon chymistry in Glasgow; this penetrating genius soon discovered the attention, the diligence and the acuteness of Black, and his love of chymical knowledge, and gave him all possible assistance in his favourite pursuits; allowed him the free use of his laboratory: and adopted him as his assistant in making his experiments, which he performed then and during his life with admirable accuracy, success and elegance.

When Joseph had acquired satisfactory knowledge of the doctrines which Dr. Cullen taught in his lectures upon chymistry, the theory and practice of physic, he removed to the house of his cousin german, Mr. James Russel, then professor of natural philosophy in the university of Edinburgh. This situation perfectly suited the genius and views of this persevering student; he there reaped the advantage of the extensive knowledge, the singular correctness in experiment, and the precision of thought of this acute and experienced philosopher.

About this time Madam Stephens's Remedies for the human calculus had gained great reputation. Although they were then known, it was supposed that some kinds of calcareous earths made better lime and lime-water than other kinds. Joseph then entered the list of experimental chymists. In his researches he found that magnesia alba was an absorbent earth, possessed qualities different from marble, limestone, chalk, and shells, and that it had when combined with acids very different effects on the human body, from these substances. When he in the 25th year of his age obtained his degree of Doctor of Medicine at Edinburgh, he chose as the subject of his Thesis, De Humore acido a Cibis orto, & de Magnesia alba.

In consequence of the removal of Doctor Cullen from Glasgow to the chymical chair in Edinburgh, Doctor Black in 1756 was called to succeed him as professor of medicine and lecturer on chymistry. When Dr. Cullen was removed to the medical chair as lecturer upon the theory and upon the practice of medicine, alternately with Doctor Gregory, Doctor Black was looked up to, as the only man capable of supporting the reputation in this branch which this celebrated school had acquired in every other.

The merit of Doctor Black, the intention of the town council and professors of Edinburgh having been known at Glasgow, his fellow professors convinced they could not have an opportunity of hearing lectures on chymistry so extensively useful, generally attended him the season previous to his removal; a compliment so great they had not before paid to any other professor. Agreeably to the expectations and wishes of all who knew his merit, he was chosen professor of

chymistry in Edinburgh on the 17th of April 1766. In this situation he did not disappoint the expectations of his friends; he taught the theory and practice of chymistry for 30 years with a reputation always increasing.

He was disposed to asthma and spitting of blood which necessarily obliged him to observe a low, cool regimen; he was consequently pale and slender. His asthmatic complaints prevented him from using much exertion in speaking, yet he spoke with so much propriety and accuracy, and without any provincial accent, that he was distinctly heard in the most distant corners of the hall in which he lectured. In this he was greatly assisted by the silence and attention of his Pupils.

After the manner of Boerhaave, he divided his course of lectures into two sections; the first contained the theory, the second the practice of chymistry. In the first section he taught, with the theories of authors, his own inventions and theories.

He described the experiments by which he found the qualities of magnesia. 1st. That it was not a species of lime, but a pure and simple earth; that it is found united with acids, as in sea-water, in the bittern which remains after the crystallization of common salt, in the salt commonly called epsom salt, and is often found mixed with limestone and with clay. 2nd. It is soluble in all the acids, but its attraction for them is weaker than that of fixed alkali, or of calcareous earth, but equal to the attraction of volatile alkali for them. 3d. That it unites with the gas formerly called by Dr. Hales fixed air, more strongly than volatile alkali, but not so strongly as calcareous earth or fixed alkali does.

By his experiments upon magnesia and calcareous earths, he found out the qualities of the gas called fixed air, now by the French chymists named carbonic acid gas. He found the effects it has upon pure calcareous earth, or lime, and upon pure alkalis, upon magnesia, and upon water when united with these substances, and the effects it has upon the animal economy.

Ancient chymists ascribed the changes which bodies undergo in the fire, to particles of fire united to them, especially such bodies, as, after having been calcined, had acquired a great attraction for animal and vegetable substances, and a great degree of acrimony, called therefore causticity; such as calcareous earths calcined to quick lime, and fixed alkalis, exposed to great heat; but Dr. Black, by his experiments upon calcareous earths, found that fire did not add any thing to them, but expelled from them an elastic vapour, which, because it seemed to have been fixed or solid in stone, was called fixed air, which name he continued because it was already familiar in philosophy. He found by experiments, that 120 grains of chalk, by solution in acid, or burning, lost 48 grains of this air.

He found that the mildness of alkalis is owing to a great quantity of this gas united to them; and that it is separable from them by quick-lime, and that then the alkalis are caustic. And, as alkalis have a stronger attraction for water than lime has, they attract water from lime, and give it the fixed air. Solutions of them in this state are called caustic leys. When it is united to magnesia, alkalis, or quick-lime, they effervesce with acids; when separated, they do not.

This is the gas which escapes from liquors in the act of fermentation, and which is often found in mines and in caves, called choak-damp.

In the time of burning inflammable bodies, that part of the atmospheric air which is called pure air, unites with the charred substance, and acquires the same qualities as the fixed air; so does air in respiration: it extinguishes flame, and destroys animal life.

The weight of this air makes it capable of being contained some time in open vessels, and it can, like water, be poured from one vessel to another. This is the cause of the death of dogs in the celebrated cave in Italy called Grotto del Cane. While the master's head is above this noxious vapour he escapes unhurt; but if on the contrary the man would take in a full inspiration of it, he would instantly fall down dead. This air is the cause of the danger of entering vats from which fermenting liquor has been drawn without purifying them; and the danger of burning charcoal in close rooms

and shows the necessity of trying all such places as mines, caves, vats, and deep wells, with lighted candles; if it extinguishes them, it will certainly destroy animal life.

This air, so destructive when applied to the nerves, is most salutary when taken into the stomach either in the form of gas, or when united to water; it is then a very agreeable acid liquor. When externally applied, it cleanses foul ulcers, and stops gangrene. It dissolves the stone, or human calculus, and cures this most painful disease.

The astonishing qualities of this air soon attracted the attention of foreign experimental philosophers. Black's experiments were repeated and his doctrines confirmed and received in opposition to every received opinion to the contrary. They excited the attention of Chymists to the investigation of every elastic fluid, by which many discoveries of great importance in the science of nature have been made; the substances air and water, which were anciently supposed elements, are now known to be compounds; and many supposed compounds are now known to be simple elements. Hence the great discoveries of the different elastic gases, by Scheele, Priestley, Cavendish and Lavoisier, and hence the very important addition of pneumatic chymistry to the system. When Lavoisier published his book of experiments on respiration, he sent a copy of it to Dr. Black, and wrote to him—"It is but just you should be one of the first to receive information of the progress made in a career which you yourself had opened, and in which we all consider ourselves your disciples."

About the winter of 1756 and 1757 he discovered the doctrine of Latent Heat, which is great by the elegant simplicity of the experiments by which he demonstrated it; and great in its consequences, because it enables us to account for many appearances of nature, which cannot be accounted for without it. Latent heat is a degree of heat contained in bodies which is not perceptible by our senses, nor indicated by the thermometer, but on proper occasions assumes a sensible form. When water sinks the thermometer to 3 °, the freezing point, it does not freeze till it sinks it 3, 4, or 8 degrees lower, and then only a small quantity of ice appears; then the thermometer rises to 32°, because the ice cannot contain so much heat as the water, it gives out its heat instantly to it. If sensible cold alone were sufficient to the congelation of water, the whole of it would be congealed at the freezing point, whereas it requires some days to congeal it, suppose the air is six or eight degrees below the freezing point. This does not happen till all the heat which is indiscoverable in the water, emerges and becomes sensible. The same happens in all bodies when they pass from a fluid to a solid state; again, when bodies pass from a solid to a fluid state, a great quantity of sensible heat is absorbed by them. When a thaw comes, the thermometer may rise in the open air six or eight degrees above the freezing point, and the snow on the ground will then be at the freezing point, and will continue at this degree for days or weeks, although it is certainly receiving sensible heat from the air all this time, and the water flowing from it is not sensibly warmer than the snow. The heat received from the air is taken up by the water, and retains it till it is again reduced to a solid form. The same is observable in all bodies when they pass from a solid to a fluid state.

When water has passed from a solid to a fluid state, and heat is gradually applied till it raises the thermometer to 212°, then it gradually assumes a volatile form. It becomes transparent and elastic like air. This is not suddenly effected, it is gradual, although the fire is constant and continually applied; neither the water, nor the vapour, or steam raise the thermometer above the boiling point, and we must chiefly remark, he put water into cylindrical iron vessels, and set them upon an iron kitchen table, which was red hot: in four minutes the water rose to the boiling point, but was not evaporated in less than twenty or twenty-five. Although the heat in this case was evidently gradually continued, no increase of heat was observed in the steam or in the water, yet that it is contained in the steam is evident from what happens in the re-

frigeratory of a common still; the water in it is heated as much by condensation of the steam of a pint of water, as it would be by cooling a pound of iron made red hot; i. e. the steam of a pint of water contains in it heat in a latent state, equal to eight hundred degrees, and upwards.

This is evident from calculation, by reckoning how much heat passes into the water before it arrives at the vaporific point, and then how long the heat is continued before all is evaporated, generally five times as long, as we may be certain equal quantities of heat pass into the water at equal times; then suppose 158 or 160 degrees of heat is thrown into the water, from the time it is set on an iron kitchen-table till it begins to boil, then 160 multiplied by 5, the time of its entire evaporation, is equal to 800 degrees of heat, carried off by the steam, and concealed or latent in it.

The same or similar appearances are observed in spontaneous evaporation. Dr. Black's doctrines of latent heat and of fixed air, are the foundation of the most rational theories of the heat produced by combustion, and breathing of animals: a vast quantity of heat is latent in our atmosphere, which becomes sensible when united with carbon, or the matter of charcoal, and becomes what Dr. Black and others called fixed air, because it was fixed in calcareous earths. In burning inflammable bodies, the carbon is united to pure air, and expells the heat from it which was latent in it, and causes it to become sensible, and can be communicated from one body to any other in contact with it. When animals draw pure air into the lungs it acquires carbon; becomes fixed air, which is not capable of containing so much heat as the pure air, leaves a great part of it in the lungs, which is communicated to the blood, and brings part with it in the breath. That animals acquire their heat by the lungs was conjectured by Dr. Black and Dr. Irvine, but the process was demonstrated by the late Dr. Adair Crawford of London, a native of the parish of Crumlin, in the county of Antrim.

This important doctrine of latent heat was never published by Dr. Black, but copies of his lectures were carried to the Continent by his students, who attended his lectures from every part of Europe. Some writers were improved by reading them, and published his discoveries as their own, as appears from a copy of a letter to Mr. James Watt, published in the 2nd. vol. of De Luc's Meteorologie, in which Mr. Watt insists that Dr. Black had first discovered and demonstrated, that heat is absorbed, and is combined with bodies when they are rendered fluid or vaporous.

The first work published by Dr. Black is his inaugular Dissertations upon fixed air and magnesia, of which he gave a more particular account in a small volume in English, which he afterwards finished and improved in a Dissertation published in the second volume of the Edinburgh Physical and Literary Essays and Observations.

An Essay of his upon the effect of lime upon alkaline salts, and a method pointed out whereby it may be used with safety and advantage in bleaching, was published in Dublin, in 1771. A Memoir of his upon the more ready freezing of water that has been boiled, was published in the Philosophical Transactions of London, in 1774. An Account of his Experiments, and of his analysis of the waters of some boiling hot Springs, near Hecla, in Iceland, which contain flint in solution, was published in the Transactions of the Royal Society of Edinburgh.

A copy of his lectures was published by the late Dr. John Robinson, of Edinburgh, in two volumes, quarto, in 1803. A Letter published by Crell, in the 10th vol. of his Collections; another to Lavoisier, published in Annales des Chemie. Why a man so eminently qualified, did not join in the pursuits of Scheele, Priestley and Lavoisier, can only be conjectured from the delicacy of his constitution, which always was injured by confinement and intense study; they induced a spitting of blood, which obliged him to submit to a low debilitating regimen of diet; however by this regimen his tender frame was preserved, and his life was prolonged till the 71st year of his age. Sitting at table, the 26th November, 1799, with his usual

fare, bread, prunes and milk, diluted with water, he was found dead, his knees close together, and the cup upon them, without having spilled a drop.

His servant found him in this seemingly easy posture, supposed him asleep, went out and shut the door, but when half down stairs, some thought or apprehension of danger struck him, he returned and looked again at his master; he went away a second time, and returned in the same manner, and upon examination found him dead.

So ended a life which had been spent in pursuit of useful knowledge, so far as the delicacy of his frame and his exertions for the improvement of his pupils permitted. His researches and discoveries procured him the respect and admiration of all acute and discerning philosophers; they laid the foundation of pneumatic chymistry.

The delicacy of his constitution prevented him from constant study, and a multiplicity of experiments; his hours of relaxation were spent in airing on horseback, and in the practice of the fine arts. His taste for drawing was correct, and he was a perfect judge of musick, he could sing or play on the flute, any plain air at first sight. Although his voice was weak, it was sweet and under perfect command. But he never indulged in poetical flights of the imagination. He delighted in the company of men of taste and literature, such as David Hume, Dr. Adam Smith, and Dr. Ferguson. They who were particularly attached to him, were those who had a taste for geological pursuits. Such were Mr. I. Clerk of Elden, who, although he was never at sea, by his work upon naval tactics, has taught our admirals to achieve the greatest victories. Dr. Roebuck and Mr. James Watt and Mr. Geddes of Leith, philosophic machinists, were particularly attached to him; so was Dr. James Hutton the writer of geological essays, in the Transactions of the Royal Society of Edinburgh, and the great improver of his country, by introducing the Norfolk husbandry into it.

Dr. Black's taste was consulted not only in composition, but in musick, drawing, and architecture. That he studied elegance and simplicity appears from his compositions, and even from his lectures, as they are collected and published by Dr. Robertson; it appeared in his dress, his countenance and in his conversation.

Regularity and method appeared in his whole conduct; of this his last will is a remarkable example. His property was chattle; he so arranged it before his death, that his executors had the least possible trouble. The whole of his property was to be divided into a number of shares, which were distributed among his relations in a manner becoming the propriety and regularity of his character.

Separated as he was from his parents at an early period of his life, he did not forget their tender and affectionate regard, but continued to love, honour, and revere them. He and his brothers and sisters lived on terms of mutual attachment and love. He never lost a friend, but by the fatal stroke of death. His pupils held him in grateful remembrance.

USEFUL INVENTIONS.

A Receipt for making Family Wine, extracted from the Bath and West of England Society's Letters and Papers on Agriculture, Planting, &c. furnished by William Mauthews of Bath. One of the Correspondents objects to using spirits in the compound; they may be used or not at the choice of the maker.

TAKE black currants—red ditto—white ditto—ripe cherries (black hearts are the best)—rasberries—each an equal, or nearly an equal quantity; if black currants be the most abundant, so much the better. To 4lb of the mixed fruit, well bruised, put one gallon of clear, soft water; steep three days and nights in open vessels, frequently stirring up the mass; then strain through a hair sieve. The remaining pulp press to dryness. Put both liquids together,